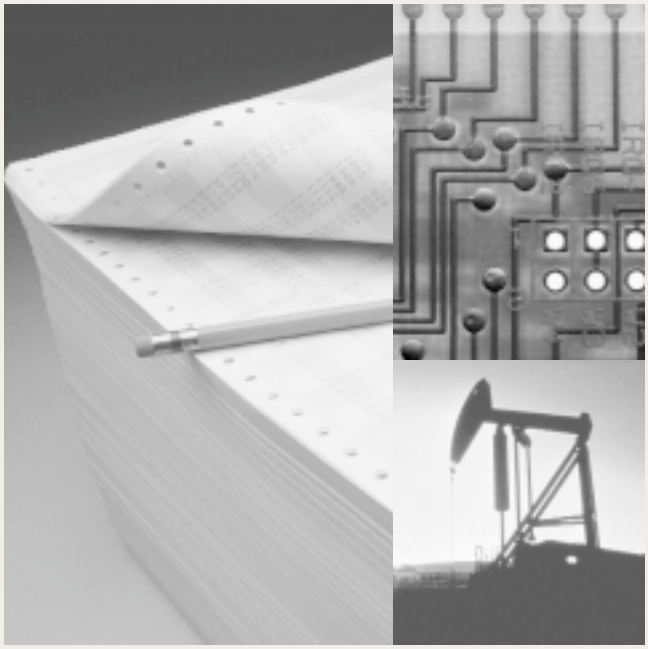
Oil & Gas
MODELING
and Analysis Program

Providing Accurate, Timely Information for Programmatic and Policy Decisionmaking



OIL AND GAS RD&D PROGRAMS

Where should DOE focus research, development, and deployment investments to yield the greatest benefits to the Nation? How will proposed environmental legislation or tax policy initiatives affect domestic oil and gas exploration and development? How effectively are oil and gas programs meeting their goals?

Decisionmakers at the Department of Energy, other Federal agencies, Congress, and State and local governments require timely, accurate, quantitative information as they consider RD&D and policy questions affecting U.S. energy resources. To provide this information, DOE has developed a program of modeling and quantitative analysis that simulates the exploration, production, processing, and storage methods of the domestic oil and gas industry. Using detailed engineering and economic models, estimates are made of potential economic recoveries of domestic oil and gas resources over a wide range of technologies, economic criteria, and legislative and regulatory environments.

Models provide DOE and its customers with unique quantitative and modeling capabilities that cannot be found anywhere else, producing information required for effective development of our Nation's natural resources.

Oil & Gas Modeling and Analysis Program

Oil and gas modeling systems support DOE in maximizing benefits from RD&D and policy programs. Unique DOE models support informed decisions by government and industry.

DOE has a responsibility for stewardship of our natural resources and for expending appropriated funds to support environmentally sensitive development of these resources for the benefit of the general public. Stewardship of our oil and gas resources includes ensuring their effective and efficient development, while minimizing environmental impact. DOE focuses its RD&D and policy efforts on removing major constraints to environmentally sensitive recovery of the domestic resource, which will yield substantial incremental oil and gas reserves for public benefit.

DOE has developed a unique suite of oil, gas, and programmatic models that are essential to satisfying its responsibilities. The models are maintained and enhanced by the Office of Fossil Energy, and provide DOE with capabilities necessary to successfully plan, implement, and manage a complex RD&D and policy program, focusing on areas that most benefit its customers. Although models of varying degrees of sophistication are available outside of DOE, none are suitable for evaluating the potential benefits of differing technologies, economic criteria, and legislative and regulatory environments over the entire U.S. resource base. FE's models are designed to evaluate these conditions.

"Metrics are essential to support ongoing assessments that will help assure prudent investment of DOE energy R&D funds with the goal of maximizing public benefits."

– *Task Force on Strategic Energy Research and Development, June 1995*

Government Role

DOE's Oil and Gas Program includes a policymaking and advisory component. The goal of the policymaking and advisory component of the Oil and Gas Program is to support decisionmakers in DOE, other Federal agencies, Congress, and State and local governments with timely and accurate quantitative information and analyses, as they consider policies affecting our domestic petroleum industry. To provide the information needed to support the Program, DOE has developed a unique suite of modeling and analytical capabilities that simulate the exploration, production, processing, and delivery components of our domestic petroleum industry.

These detailed engineering and economic models provide DOE and its stakeholders with estimates of potential economic recoveries of domestic petroleum resources over a wide range of technologies, economic conditions, and legislative and regulatory environments. These unique analytical capabilities, which cannot be found elsewhere, provide information for DOE and stakeholders to maximize the benefits of RD&D initiatives and to make informed, economically-efficient, and scientifically-sound decisions on a wide range of policies affecting the domestic petroleum industry and the Nation.

Value to Customers

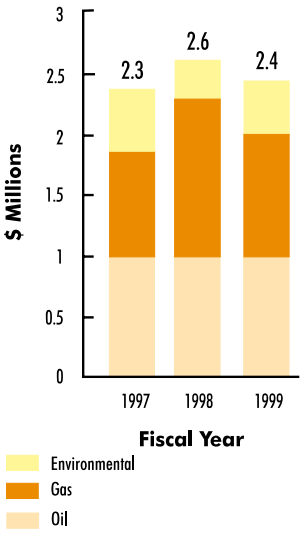
Fossil Energy continues to maintain and improve the oil and gas models to reflect current and future program objectives. The models have significant applications for DOE and its customers.

DOE as Customer

Primary uses of the models within DOE are:

- To prioritize oil and gas RD&D initiatives.
- To develop budget support documentation by estimating the relative costs and benefits of different RD&D approaches to solve exploration, production, environmental, and processing problems facing the oil and gas industry.
- To support the oil and gas policy analysis responsibilities of DOE and other Federal agencies. The models provide quantitative and analytical tools to assess the costs and benefits of a wide range of policy initiatives affecting the Nation's petroleum industry. These initiatives include financial issues (e.g., changes to the Federal tax code affecting the petroleum industry or royalty relief on Federal lands), environmental regulations affecting the industry, and issues relating to the development of Federal lands.

Oil & Gas Modeling and Analysis Program Budget



Success Stories

Support To States

Worked with oil and gas producing States to assess the effects of State taxes on the performance of the industry. To date, eleven States have revised their tax codes to support the industry based on these analyses.

Provided an assessment of the costs and benefits of eco-royalty relief to the Greater Green River Advisory Committee. Based on this analysis, the Committee adopted eco-royalty relief as a recommendation to the States in the Greater Green River Basin.

For the Interstate Oil and Gas Compact Commission, assessed the impact of idle oil and gas wells on industry production, State and Federal revenues, and jobs. These results were included in IOGCC's study and recommendations on idle wells.

Drivers

- FE needs information from modeling and analysis to make wise and efficient choices for utilizing appropriated funds to maximize the benefits of its oil, gas, and environmental RD&D programs for the public.
- FE and DOE budget decisionmakers need high quality information on how varying levels of budgetary funding will affect the benefits that can be derived from oil and gas RD&D programs. Decisionmakers will use the information to choose appropriate funding levels that maximize the benefits of these programs versus the costs of their implementation.
- Policymakers in DOE and in other Executive branch agencies, in Congress, in State energy and environmental agencies, and in the petroleum industry need quantitative and modeling analyses to assist them in determining the relative benefits and costs of a wide-range of policy initiatives affecting the petroleum industry.
- FE requires models specifically designed to evaluate the potential benefits of differing technologies, economic criteria, and legislative and regulatory environments over the entire U.S. resource base. Other models available outside of DOE do not provide the required capabilities.

Goals

- Provide high quality modeling and quantitative analyses in a timely manner to support FE and DOE in achieving their stated goals and objectives.
- By 2010, fully integrate DOE's oil and gas models, so that they can be run in unison to simulate oil and gas operations.
- Maintain and enhance models that will continue to be recognized and relied on by DOE, Congress, other governmental agencies, industry, and others as analytical tools for quantitative and modeling simulations of the petroleum industry.

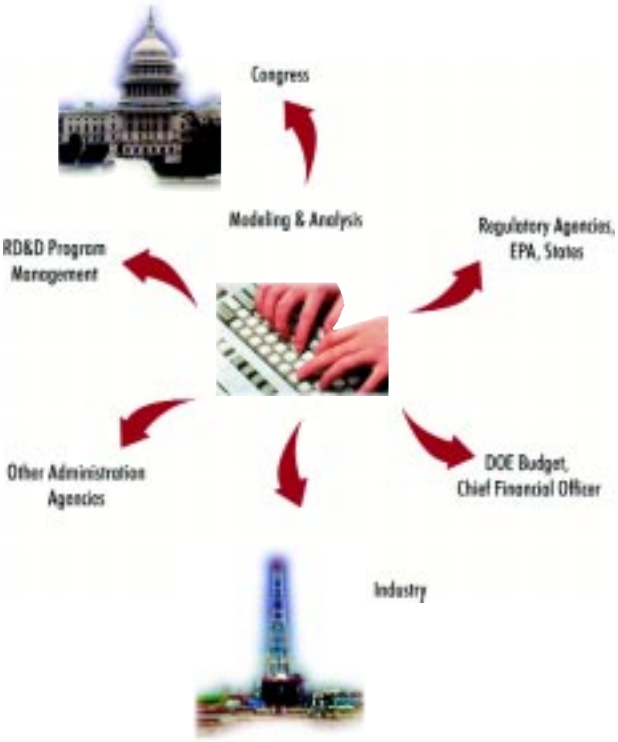
Oil and Gas Modeling & Analysis Program

Strategies

- Maintain and enhance a unique set of oil, gas, and programmatic models with capabilities that are not found elsewhere.
  - Ensure that model coverage is consistent with RD&D and policy program scopes, by continually upgrading and improving models to expand regional coverage and to reflect the impacts of new technologies, economic conditions, and regulatory environments.
- Provide quantitative analyses that apply the set of models effectively, to provide timely, accurate information that meets the specific requirements of customers.
  - Analyze the potential impacts of the oil, gas, and related environmental RD&D programs on current exploration, production, and utilization of our petroleum resources.
  - Provide policymakers with accurate and timely quantitative analyses of legislative and regulatory initiatives affecting the petroleum industry, to ensure that these initiatives are cost-effective and beneficial to the industry and the Nation.

Measures of Success

- Results of the quantitative and modeling analyses provide timely and useful information as needed.
- Results of the analyses reflect the entire suite of program elements and model their interactions, as well as their direct impacts.
- Models succeed in peer reviews on a regular basis and ensure that they are of high caliber and acceptable to knowledgeable experts.



Success Stories

Other Support To Industry

Assessed an industry proposal to extend the Federal Tax Code Section 43 tax credit for enhanced oil recovery operations to horizontal wells. This proposal is being considered by Congress, but no action has been taken yet.

Working with the National Petroleum Council on its new study of the potential of the domestic natural gas industry to meet expected increases in future gas demand. DOE will provide modeling and quantitative analyses as requested to support that study.

Other Customers

DOE also uses these models to provide analytical support to many other customers outside of DOE who do not have such capabilities.

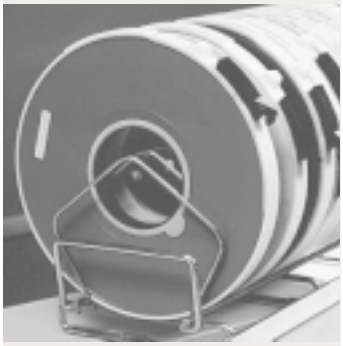
- The U.S. Congress relies on these models to analyze the costs and benefits of legislative initiatives that impact domestic oil and gas production and reserves.
- Local and State governments rely on the models to assess the costs and benefits of financial or regulatory reforms on their oil and gas industries.
- Oil and gas operators use the models to identify marginal properties with potential for additional recovery through application of improved technologies. Public versions of TORIS (Total Oil Recovery Information System) databases and models are routinely used by major and independent oil companies in prospect evaluation and strategic planning. These models provide unique analytical capabilities that many operators do not have on their own. Independent and small operators, in particular, may not have the resources to develop such capabilities.

- Professional organizations, such as the Petroleum Technology Transfer Council, Independent Petroleum Association of America, Interstate Oil and Gas Compact Commission, National Petroleum Council, and others, also rely on these models. DOE analytical systems have significant applications in technology transfer and resource evaluation for less sophisticated operators, particularly small independent producers.
- Other Federal agencies use these models to manage Federal lands with oil and gas resources. For example, evaluations conducted for the Department of the Interior's Bureau of Land Management supported formulation of an effective transfer payment strategy to increase oil production from Federal lands. The evaluations resulted in royalty reduction for marginal oil leases and heavy oil production.
- DOE also has used its models to advise the Environmental Protection Agency on the costs and benefits of proposed environmental regulations affecting the petroleum industry.

Analytical Models

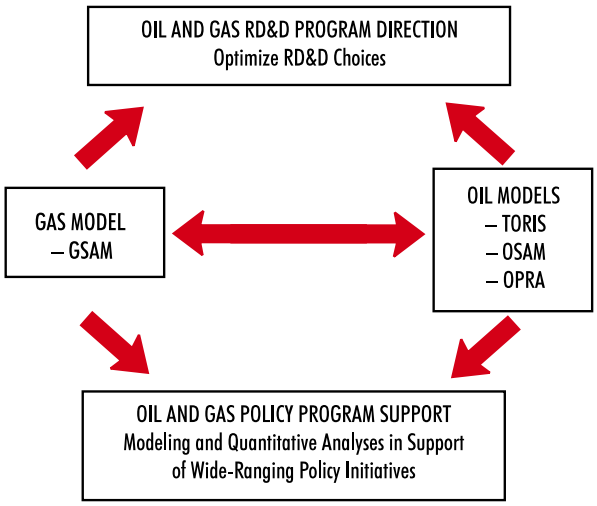
Fossil Energy's suite of analytical models comprises the following:

- TORIS – Total Oil Recovery Information System – couples engineering models with detailed economic models to estimate potential economic recovery over a wide range of extraction technologies and economic criteria. The system's extensive databases of geological reservoir properties, production levels, and engineering criteria support detailed analyses. TORIS results are used to focus DOE's oil RD&D programs on potentially high benefit areas, to develop budgetary insights to support program development, and to assess the effectiveness of reaching DOE's RD&D goals and objectives. TORIS is operated by DOE's National Petroleum Technology Office in Tulsa, Oklahoma.
- OSAM – the Oil Supply Analysis Model – provides quick, yet accurate, results in analyzing different policy options. OSAM relies on TORIS for its basic data on production and economics. This modeling system is operated by ONGPT at DOE Headquarters.



FE continues to maintain and improve its analytical models, making them increasingly effective and responsive to changing requirements.

- GSAM – Gas System Analysis Model – is a comprehensive system for analyzing natural gas exploration, extraction, storage, distribution, and utilization characteristics. Like TORIS, GSAM contains engineering models coupled with detailed economic models to estimate recovery and utilization of natural gas over a wide range of technical and economic conditions. GSAM results are used to: focus DOE's RD&D related to gas supply to potentially high benefit areas; develop budgetary insights to support program development; and assess the effectiveness of reaching DOE's RD&D goals and objectives. GSAM also provides modeling and analytical capabilities to support DOE's gas policy initiatives. GSAM is operated by the Federal Energy Technology Center (FETC) in Morgantown, West Virginia.
- OPRA – Oil Program Resource Assessment – is a program metrics model used to estimate potential benefits of specific oil-related RD&D projects. This comprehensive modeling system enables DOE to evaluate its progress toward achieving stated goals and objectives. OPRA is operated by DOE's National Petroleum Technology Office in Tulsa, Oklahoma.



Oil and gas models are used for RD&D program direction and policy support.

Strategies for the Future

Fossil Energy has been developing oil and gas models since 1984, and will continue to maintain and improve the models, making them increasingly effective and responsive to changing requirements. Model maintenance includes updating geologic, technical, regulatory, and cost data on a regular basis.

The original modeling system focused solely on enhanced oil recovery technologies in the lower-48 States. As funds and information have become available, models have been expanded and refined to include the entire domestic oil and gas industry. Future upgrades will include the coverage of offshore regions, as well as capabilities in exploration, environmental, and refining technologies.

In addition, new data and data sources must be discovered to advance oil and gas operations analyses. Modeling and database activities are in the forefront of technology development because much of the data necessary to improve the modeling system do not exist at this time.

Six Success Stories

Support To Other Federal Agencies and Congress

Assessed the remaining oil resources in Federal offshore properties in the Gulf of Mexico for the Minerals Management Service and identified the need for further advances in technology to ensure that these resources are fully recovered in an environmentally safe manner before they are prematurely abandoned.

Working with the Bureau of Land Management to develop performance standards for their Federal onshore oil and gas leasing program. These new standards will give BLM detailed information on how its leasing program will affect current and future oil and gas production, royalty collections, other State and Federal revenues, jobs, and other economic parameters.

Supported the Department of Treasury and the National Economic Council by assessing the costs and benefits of various proposals to provide tax relief for marginal wells, and to revise the tax accounting treatment for geological and geophysical expenses. These proposals have not been adopted as yet.

Analyzed the costs and benefits of proposals for royalty relief for heavy oil wells and marginal oil wells on Bureau of Land Management lands. This resulted in the promulgation of new regulations, giving royalty relief for heavy oil wells and the extension of royalty relief regulations for marginal wells.

Analyzed heavy oil royalty relief provisions proposed by Congress and testified before the House Committee on Energy and Mineral Resources on these results. This resulted in the Committee supporting the royalty relief regulations ultimately passed by the Bureau of Land Management.

Provided analysis to Congress on the costs and benefits of repealing the Federal Tax Code transfer rules relating to the use of percentage depreciation allowances by independent producers. This led to the simplification of these rules in the Tax Code.